

Natural Resource Development in Alaska and Cargo Airships

Cargo Airships for Northern Operations

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University of Alaska Anchorage

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MINERAL, OIL, AND GAS RESOURCES OF ALASKA

DIGITAL SHADED RELIEF IMAGE OF ALASKA
BY J.R. RIELHE ET AL., 1996,
USGS MISCELLANEOUS INVESTIGATIONS MAP I-2585

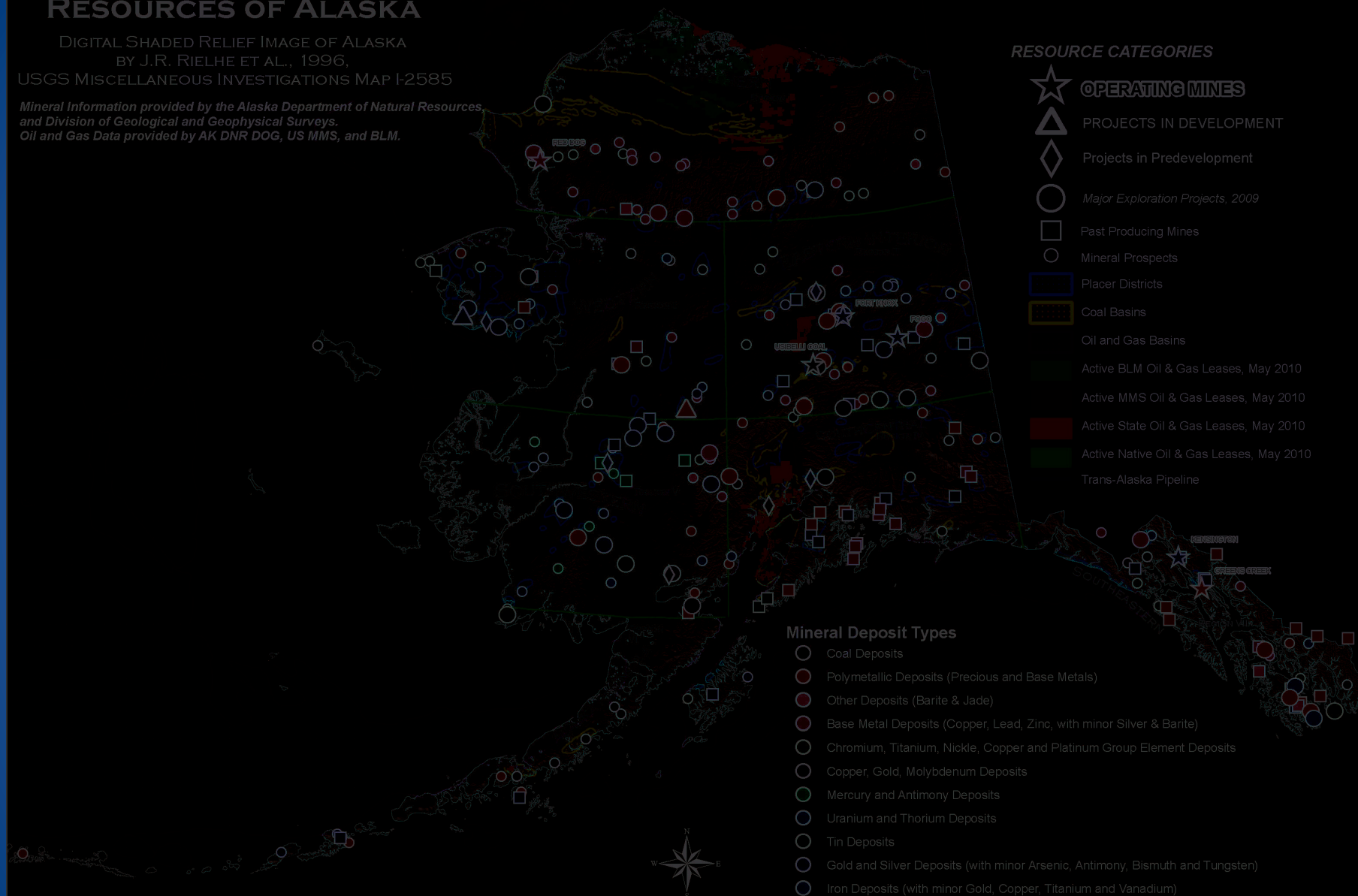
Mineral Information provided by the Alaska Department of Natural Resources
and Division of Geological and Geophysical Surveys.
Oil and Gas Data provided by AK DNR DOG, US MMS, and BLM.

RESOURCE CATEGORIES

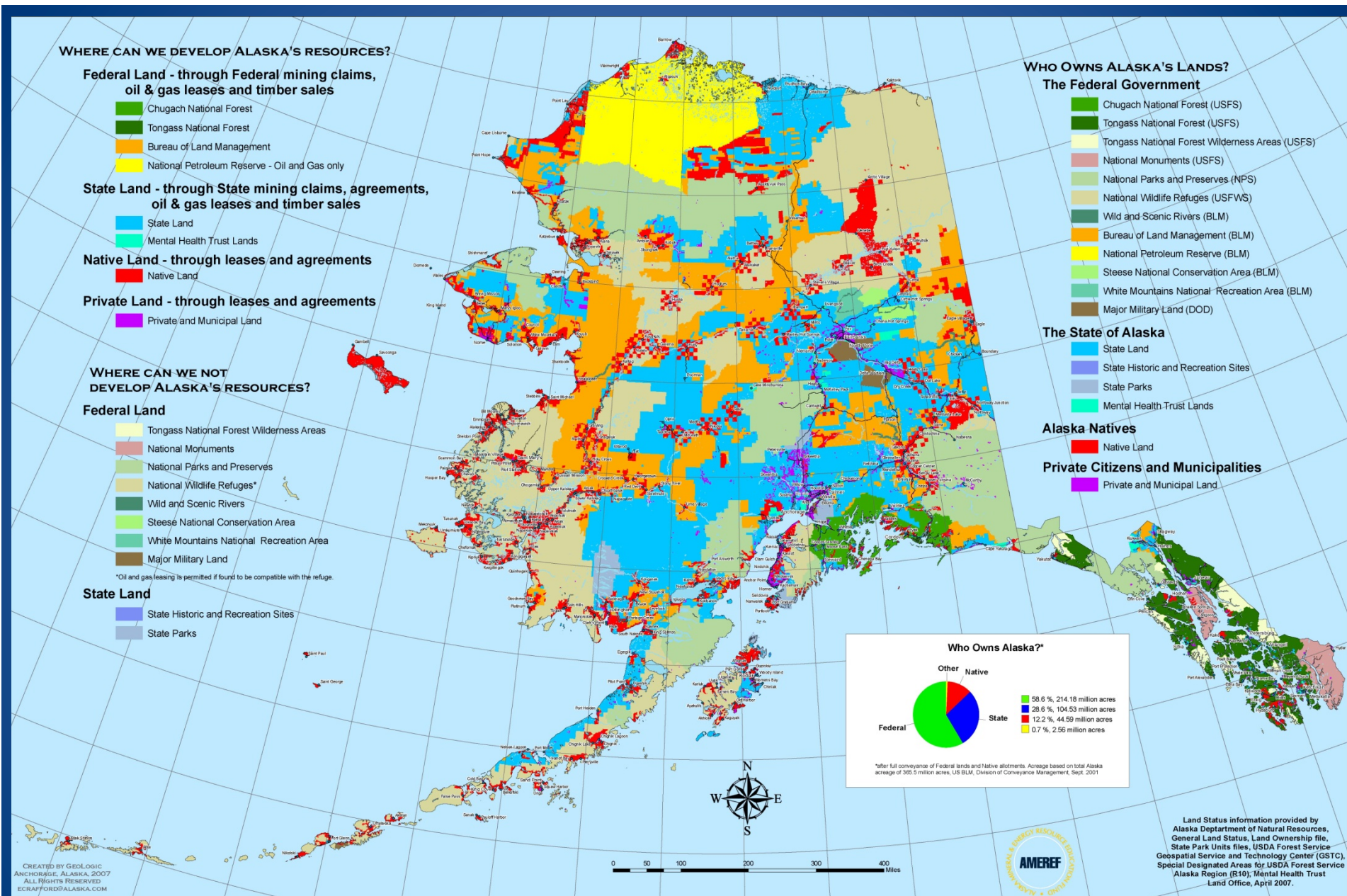
- ★ OPERATING MINES
- ▲ PROJECTS IN DEVELOPMENT
- ◇ Projects in Predevelopment
- Major Exploration Projects, 2009
- Past Producing Mines
- Mineral Prospects
- ▭ Placer Districts
- ▭ Coal Basins
- ▭ Oil and Gas Basins
- ▭ Active BLM Oil & Gas Leases, May 2010
- ▭ Active MMS Oil & Gas Leases, May 2010
- ▭ Active State Oil & Gas Leases, May 2010
- ▭ Active Native Oil & Gas Leases, May 2010
- Trans-Alaska Pipeline

Mineral Deposit Types

- Coal Deposits
- Polymetallic Deposits (Precious and Base Metals)
- Other Deposits (Barite & Jade)
- Base Metal Deposits (Copper, Lead, Zinc, with minor Silver & Barite)
- Chromium, Titanium, Nickel, Copper and Platinum Group Element Deposits
- Copper, Gold, Molybdenum Deposits
- Mercury and Antimony Deposits
- Uranium and Thorium Deposits
- Tin Deposits
- Gold and Silver Deposits (with minor Arsenic, Antimony, Bismuth and Tungsten)
- Iron Deposits (with minor Gold, Copper, Titanium and Vanadium)



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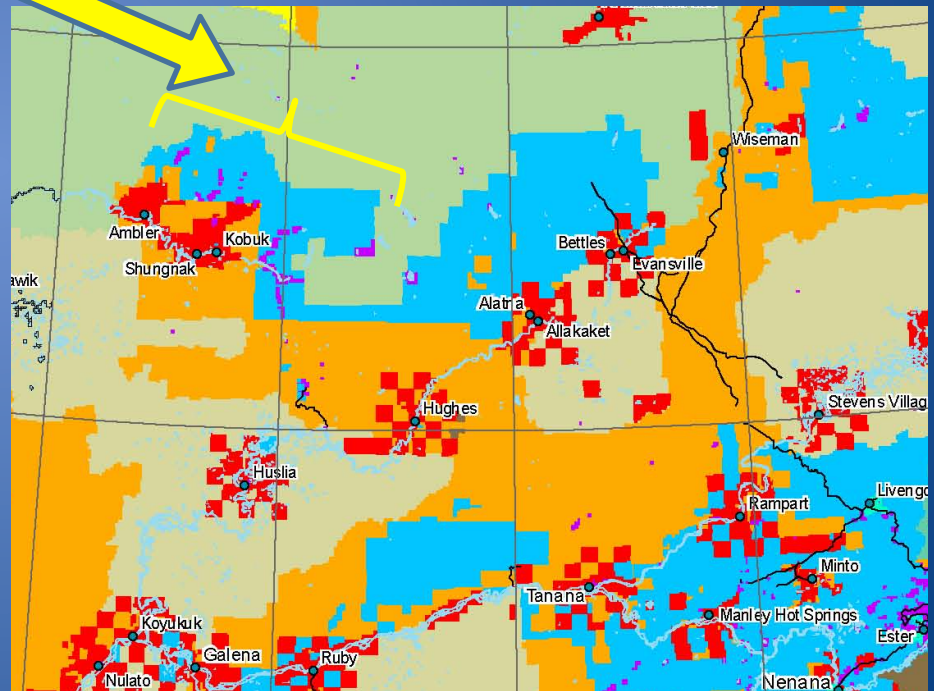


CA' s – Major Potential Benefits

Alternative to road construction across federal conservation system units (CSU' s)

Example:

Ambler Mining District (Cu, Pb, Zn, Ag, Au) in NW Alaska is located primarily on State (blue) lands largely encircled by federal CSU' s (pale gray/green colors) . District hosts +40 million tons of ore.



CA' s – Major Potential Benefits

- Much of Alaska is jurisdictional wetlands. CA' s could help to minimize wetlands disturbance, reducing permitting timelines and cost of compensatory mitigation
- CA' s could help to address local concerns about increased public access & pressure on fish/game resources due to roads built into rural Alaska.

Cargo Airships

General Questions

- Would cargo airships (CA' s) require hangars? (Hangars could add significantly to capital costs.)
- How might development of CA' s impact helium supply/price and how might capital/operating costs for CA' s then be affected?
- Load balancing: Is one-way transport of heavy loads (e.g., empty backhaul) an issue?
- What are weather-based/seasonal limitations? (wind, temperature, etc.)

Concerns

- Investor confidence: Remote natural resource development projects are capital intensive – investors will probably demand technology demonstration before committing to financing of initial projects dependent on CA's.
- Any given project probably couldn't rely on a single CA, but would require 2 or more to allow for reasonable backup/redundancy.

Idea (!)

- The Aleutian Islands and the Arctic have been seeing increasing marine traffic, but these areas are remote and generally lack developed ports with emergency response capabilities.
- Could a CA be employed as a rapid response tow vehicle for a marine vessel in distress? Examples: Selendang Ayu grounding in the Aleutians in December 2004; near grounding of Golden Seas in Aleutians in December, 2010.
- A CA wouldn't need to tow a distressed vessel to port, but could help to keep it off the rocks until a marine tow vessel arrived.

Forestry

- Applicability of CA's appears limited:
 - Div. of Forestry reports that balloon logging attempts haven't been very successful (down time due to winds, etc.)
 - Cycle times for successive trips likely too slow for commercial logging
 - Extreme convective winds at fire sites would likely limit use as fire suppressant carrier/deliverer

Oil & Gas

- Potential for support of exploration drilling, especially if continued warming shortens window for operation of ice roads in Arctic.
- In event of an oil spill, possible means of rapid delivery of dispersants and other supplies.
- Application of CA's to oilfield development/production is less evident.

Mining

(one of most likely applications?)

- Mines need to move large quantities of materials/ supplies
- Numerous federal Conservation System Units (CSU' s) in Alaska are obstacles to road construction
- It' s difficult for remote small mines to amortize cost of road and port construction – heavy lift airships could be viable alternative

Precious Metal vs. Base Metal Mining

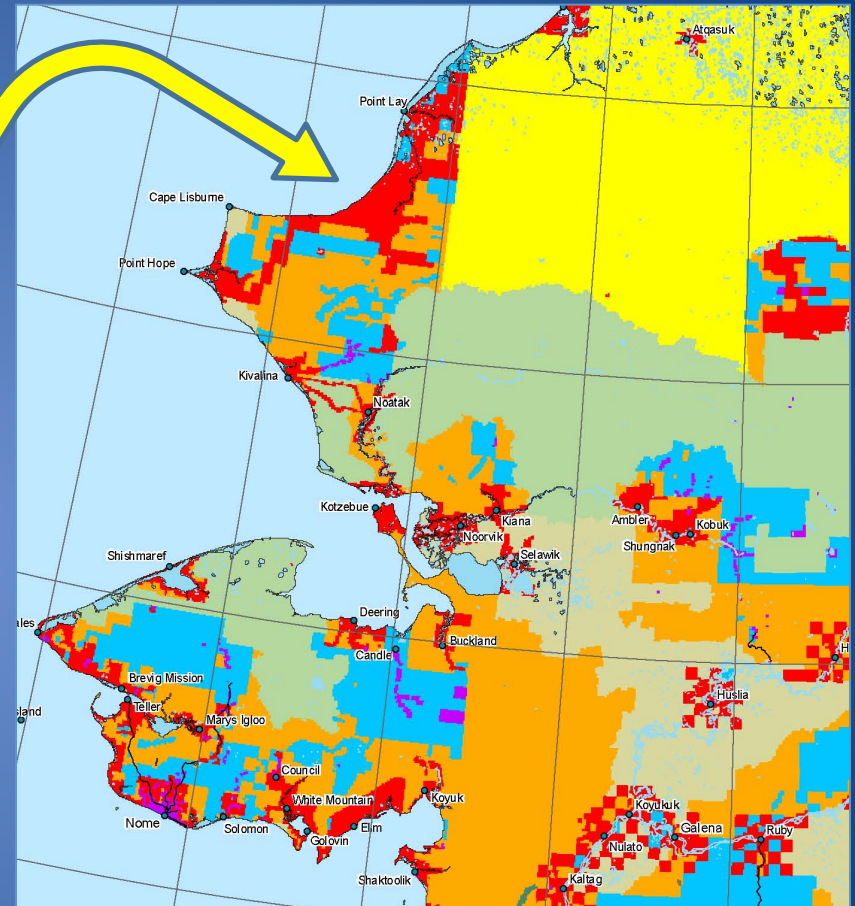
- Both base (copper, lead, zinc, etc.) and precious (gold, platinum group elements) metal mines require import of large quantities of materials, parts and supplies.
- However, base metal mines produce much larger quantities of product for out-shipment, in the form of metal concentrates, than do precious metal mines which produce smaller amounts of higher value product.
- CA's might be especially applicable to base metal mines, where they would carry heavy loads in both directions.

Mine Reclamation/Closure

- At closure, salvage values may dictate whether equipment, buildings, etc. are demobilized or disposed of as inert solid waste on site. CA's could enhance economics of demobilization. (Note: mine equipment is often pretty "tired" at mine closure.)
- CA's could be viable option for delivery of fuel and reagents (lime) for post closure water treatment (which may last decades or even be perpetual), particularly if reclamation & closure plans mandate removal of roads after operations cease. Red Dog lead-zinc mine in NW Alaska is potential example.

NW Arctic Coal

- Enormous quantities of high quality (metallurgical) coal occur on north flank of Brooks Range, particularly west of NPR-A, near Point Lay.
- There is a lack of deep water and year-round port sites in the area and federal CSU's are obstacle to road construction.
- Potentially, CA's could deliver coal to deep water ports on south side of Seward Peninsula or elsewhere (?).



Questions/Suggestions?